L2(5.2) - Translations of a Quadratic Relation

1. factored form: $y = a(x - s)(x - t)$

2. standard form: $y = ax^2 + bx + c$

3. vertex form: $y = a(x - h)^2 + k$

a tells us the direction of opening (up or down), and any vertical scaling (stretch or compression)

h is the x-coordinate of the vertex.

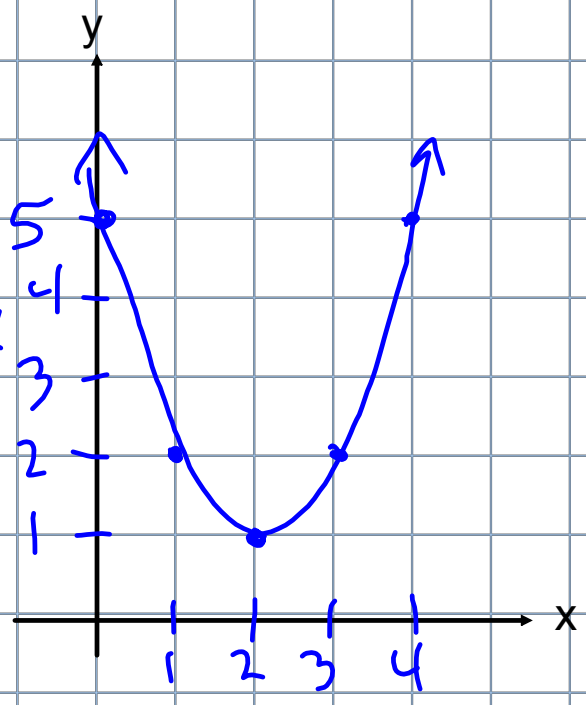
k is the y-coordinate of the vertex.

Ex.1 Graph $y = (x - 2)^2 + 1$ using a TOV.

x	y
0	5
1	2
2	1
3	2
4	5

Vertex

vertex is (2, 1)



The vertex of the parent function, ★ $y = x^2$, is (0, 0).

If the vertex has moved from (0, 0) to (h, k) then the graph has been

translated ★ vertically by k units (up or down)

and ★ horizontally by h units (left or right)

Vertex Form: $y = a(x - h)^2 + k$

What about the signs of h and k?

Ex.2 State the coordinates of the vertex and direction of opening.

(a) $y = (x - 5)^2 + 4$ Vertex (5, 4) Opens Up

(b) $y = 1(x + 3)^2 + 11$ Vertex (-3, 11) Opens Up

(c) $y = -2(x - 6)^2 - 8$ Vertex (6, -8) Opens Down

(d) $y = \frac{3}{4}(x + 13)^2 - 2$ Vertex (-13, -2) Opens Up

(e) $y = -(x - 4)^2 + 5$ Vertex (4, 5) Opens Down

Ex. 3. Identify the transformations (in the correct order), the vertex, axis of symmetry, and the direction of opening.

a) $y = (x - 2)^2 - 3$

Horizontal shift
Right by 2 units

Vertical shift down
by 3 units

Vertex (2, -3)
AOS $x = 2$
Direction of opening: Up
Optimal value: -3

b) $y = 2(x + 4)^2$

Transformations

Vertical stretch by a factor of 2
Horizontal shift left by 4 units

Vertex (-4, 0)
AOS $x = -4$
Optimal value: 0
Direction of the opening: Up

c) $y = -0.5x^2 + 4$ ⇝ $y = -0.5(x-0)^2 + 4$

Transformations

Vertical Reflection in the x axis

Vertical compress by a factor of 0.5

Vertical shift up by 4

Vertex: (0,4)

AOS $x = 0$

optimal value: 4

Direction of opening: Down

Assigned Work:

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